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Greenwich time very nearly correct: hence an observer having ascertained his constant error, has the true longitude from a single set, taken either ⊙ E. ☾ or ⊙ W. ☾.

This voyage my constant error has been very nearly the same throughout. Last voyage the ⊙ E. ☾ lunars gave eighteen seconds more subtractive error than the ⊙ W. ☾ on the passage out to India, and thirty seconds less during the passage home. I am of opinion that this difference arose from a change in the state of the sextant during our stay in port.

What I consider to be new in this method is, its enabling an observer of lunars to find rates for chronometers each fortnight of his voyage, and so to mean ⊙ E. ☾ and ⊙ W. ☾ lunars—though several days have elapsed between the observations—that he obtains an original error for chronometers, which is very near the truth, and a constant error for himself, by the application of which a single set of lunars gives the true longitude. I have practised the method for nearly five years, and it has never misled me in determining the ship's position. My knowledge of the general accuracy of other observers convinces me that they may do the same, which, I think, this paper proves.

It cannot be too generally known that lunars a month old are very valuable. I have the calculations from which my errors and rates are deduced. They are at the service of any person wishing to see them.

Report of the Radcliffe Observer to the Board of Trustees, July 1, 1853.

The principal event reported upon is the completion of the electric communication between the Radcliffe Observatory and the Royal Observatory of Greenwich. The difference of time between the two Observatories has not yet been determined.

Since the last meeting two volumes of the Radcliffe Observations have been published, which bring down the published records of the Observatory to the end of 1851. The Observations for 1852 are stated to be ready for the press.

The calculations for the Catalogue of Circumpolar Stars, which were committed to Mr. Luff, have been brought down to the period of the last published volume; and it is expected they will be altogether completed before the next meeting of the Board.

Mr. Johnson proposes printing the Catalogue separately as a supplement to the fourteen volumes of Observations, of which it will contain the substance, retaining the same form and type.

The Heliometer continues to maintain its high character. Two years' experience has pointed out certain minor faults, which Mr. Johnson believes to be remediable; but he is waiting the completion of a long series of observations on which he has been engaged before he communicates with the maker on the subject. Such is the power of the instrument, that he believes a change of

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relative position of two stars, marked by the $\frac{1}{4000}$th part of an inch on its scale, would not be undetected.

Steps have been taken for the construction of a Photographic Barometer and Thermometer. Mr. Johnson hopes, at the next meeting, to be enabled to report a considerable improvement in the meteorological department of the Observatory.

The Report concludes with some suggestions relative to the internal arrangements of the Establishment.

Remarks on the Erection of the Time-Ball of the Royal Observatory, Edinburgh. By Professor Piazzi Smyth.

The simplest principle of a time-signal is to let fall some sort of conspicuous body at the appointed instant. To be seen at a distance, it must be large; to be equally visible from all directions, it must be spherical; and to be well seen, projected as it will always be here on the sky behind the lofty Nelson's Monument to all observers except such as may be on higher ground still, it requires to be painted black. Again, that it may always descend with equal velocity, whether the day be calm, or whether there be much wind pressing the ball sideways against its supports and retarding its descent by friction, it must be heavy; and, in order that the observation be of as exact a nature as possible — in order that the instant of the *beginning* of the descent may be observed with the utmost accuracy — there must be a cross staff on the top of the mast, up to and in contact with which the ball is to be hauled, and the instant of separation of the ball in its descent from the said cross staff indicates the moment of the *beginning* of the fall with abundant precision.

We have thus a large and heavy ball (say four feet in diameter) hauled up to the top of a mast with cross-bars on the summit, and made to fall at a certain instant daily. That is the simple principle; but what takes place in practice? Firstly, such a ball falling a great height would soon break itself to pieces; and the stronger it is made, the heavier it must be, and the more suicidal force it will have. Secondly, the effect would be also that of a ramming engine to destroy the structure whereon the ball fell, in the present case the many-storied tower of Nelson's Monument, with all its primitive architectural decorations.

The earliest signal-balls which were made, though provided with ropes passing over pulleys by which they were enabled in their descent to raise a series of weights in order to check in a gradual manner the velocity of their fall, were yet invariably found, after a short time, to pull or to smash themselves to pieces. Steel springs were next tried to break the force of the concussion, but were pretty sure to be themselves snapped with a heavy ball, while a light one would not descend quick enough on a windy day. Recourse was finally had to compressed air, a spring of perfect temper

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